REMARKS

The claims remaining in the application are 1-17.

Rejection Under 35 U.S.C. § 102

The Office Action has rejected claims 1-4, 7-12, and 14-16 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,512,994 (Sachdeva). This rejection is respectfully traversed.

The Office Actions states that Sachdeva discloses "a method for creating a dental model from a series of images of an intra-oral object." This is not entirely correct. One of the crucial aspects of the process described in Sachdeva, obtaining data of an orthodontic structure, is not described fully enough to anticipate the present invention. Although the specifications of Sachdeva do state that the data may be obtained "by scanning a patient's mouth" and gives examples of a laser scanner, light scanner ultrasound, MRI, or CAT scan, it is not clear from the reference how this information is fully built into a three-dimensional model. For example, the reference states that a light may be "directly performed on the patient." It would not be practical to perform a light scan or a laser scan on all surfaces of a patient's tooth using this type of apparatus. This is further emphasized by the reference statement that scanning techniques are "typically done on a plaster model." Therefore, taking multiple laser scans inside a patient's mouth appears to be conjecture on the part of Sachdeva, and the practical application would be images of a plaster model.

The present invention, however, captures "a series of images of an intra-oral object." Thus, the present invention is actually producing the series of images in a patient's mouth, including a control target.

Even if it could be assumed, for the sake of argument, that sufficient information was disclosed in Sachdeva about how to build a three-dimensional orthodontic model, it would still not anticipate the present invention. For example, Sachdeva states that "a true three-dimensional image can be obtained by x-ray techniques such as computed tomography." The present invention, at a minimum, shows an alternative method for creating a dental model from "a series of images." The method covered by the present invention is not only substantially different, but significantly less expensive, with respect to

operation of equipment, than a technique such as CT or even less expensive than the equipment necessary for performing laser scanning.

The Office Action states that Sachdeva discloses capturing a series of images from "a plurality of capture positions." Sachdeva, however, is not using a plurality of images to build a three-dimensional image, as in the present invention, he is using multiple images to map a "two-dimensional images of a tooth onto the three-dimensional model." See column 5, lines 50-58. Thus, Sachdeva is starting with a three-dimensional image, and taking additional two-dimensional images to map to the three-dimensional model to show movement of teeth over the course of the orthodontic procedure, which may last months or years.

The Office Action states that Sachdeva shows "a control target arranged with respect to the object." The independent claims have been amended to more clearly point out that the control target is separate from the tooth and located "in close proximity" to the tooth or intra-oral object. The "control" features that the Office Action refers to at column 4, lines 35-40, are markings placed on the tooth to allow for "scaling the orthodontic data to match the actual orthodontic size." In the present invention the target is separate from the tooth, and is closely controlled with respect to dimensions, and provides reference features that may be used to create the dental model of the present invention.

There may be some confusion with respect to Sachdeva's use of the terms "scaling" and "mapping." The process that is disclosed by Sachdeva involves merely resizing the image with respect to marks on a tooth and mapping it to three-dimensional model. This is different from the "photogrammetrically aligning" method of the present invention. This is better understood by reference to the specifications wherein the particular features of photogrammetric alignment is discussed in detail. As used in the claims of the present invention, photogrammetrically aligning refers in essence to identification of control points on the image, measurement of the image, coordinates of the control points, analytic adjustment to correct physical parameters, and three-dimensional morphing. This is significantly different from the use of the terms of scaling and mapping in the Sachdeva reference.

Stated another way the target is independent of the scene. This means that the target is not only precisely known in terms of shape and

dimension, it is independent of the imaging process; it is known to be stable and therefore is not a source of error. It is not part of the patient, the tooth, or the imaging system. In that way it provides independent dimensional information that is used as control, i.e., the camera parameters, image measurements (of common features), and computed points which make up the three-dimensional model are all simultaneously adjusted (corrected) to the control information. It is used to remove error. What Sachdeva does is scale things so that they look the same, not remove error in the measurements or the model. In the case of Sachdeva one could scale/map the image so that they overlay the model, without ever correcting dimensional error. In other words, Sachdeva can line things up and correct for any mis-alignment that can be due to movement.

Rejection Under 35 U.S.C. § 103

The Office Action has rejected claims 5, 6, and 13 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,512,994 (Sachdeva) in view of U.S. Patent 6,648,640 (Rubbert et al.). This rejection is respectfully traversed.

The Office Action has rejected claim 17 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,512,994 (Sachdeva). This rejection is respectfully traversed.

Applicant's previous amendment mailed October 15, 2004 pointed out specific differences between the Rubbert et al. reference and the present invention. These remarks are not repeated here for the sake of brevity. Neither Sachdeva, as distinguished above, or Rubbert et al., either in combination or individually, show all the features of the present invention. Therefore, the combination of these references do not make the claims of the present invention obvious.

CONCLUSION

Dependent claims not specifically addressed add additional limitations to the independent claims, which have been distinguished from the prior art and are therefore also patentable.

In conclusion, none of the prior art cited by the Office Action discloses the limitations of the claims of the present invention, either individually or in combination. Therefore, it is believed that the claims are allowable.

If the Examiner is of the opinion that additional modifications to the claims are necessary to place the application in condition for allowance, he is invited to contact Applicant's attorney at the number listed below for a telephone interview and Examiner's amendment.

Respectfully submitted,

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If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.